Argonne National Laboratory Overview

U. (Balu) Balachandran
Director, Superconductivity Technology Program
Argonne National Laboratory

DOE Annual Peer Review

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ANL Superconductivity Program

- Wire research
  - 1st generation BSCCO wire/tapes
  - Scalable processes for 2nd generation coated conductors
- Cooperative Research with partners
  - Wire research
  - Superconductivity Partnership Initiative
- Implementing agent for the Intl. Energy Agency agreement for assessing the impacts of HTS.

Leveraged by DOE-Office of Science, AF/OSR, and industry cost-sharing.

Collaborators

DOE funding is beneficially leveraged by using external expertise/facilities and forming partnerships with other organizations.

Industry

- American Superconductor
- Boeing
- ChemImage
- IGC–SuperPower
- S&C Electric Co.
- UES, Inc.

National Labs.

- LANL
- ORNL

Universities

- University of Illinois
- Ohio State University
- Illinois Inst. Technology
- Augsburg University
- Cali University
- SUNY/Albany
- University of Wisconsin
- FZK, Karlsruhe

ANL R&D is industry driven.

AMSC/ANL/LANL/UW
Wire Development Group

American Superconductor

AMSC Scaling-up BSCCO-2223 Technology

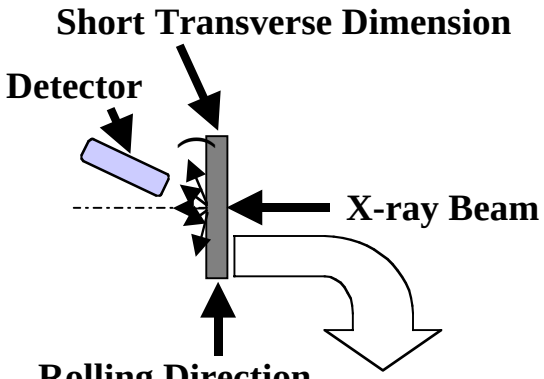
Present:	500 km/yr at ~$250/kA-m (77K, sf)
2002:	Devens produces first wires
2004:	$50/kA-m (77K, sf) target price

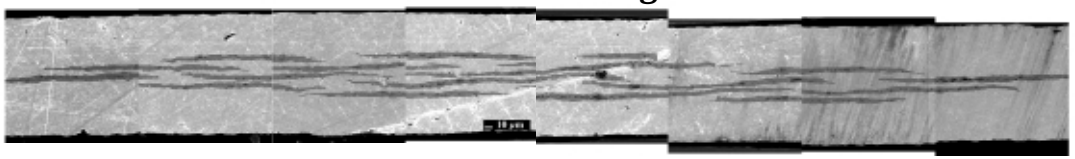
To broadly replace Cu, price <$50/kA-m is required.

Beyond 2004: Advanced technology

R&D is required now to deliver advanced technology later.

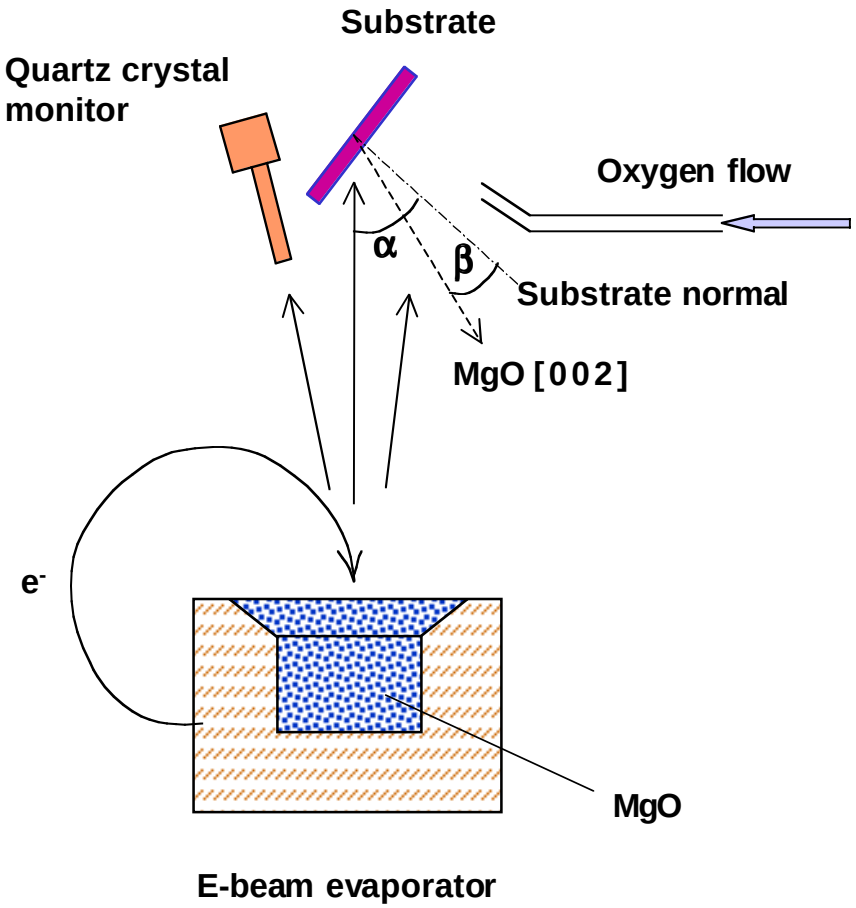
Transmission XRD of Ag/Bi-2223 Wires at Advanced Photon Source





With the high X-ray energies and intensities at the Advance Photon Source (APS), XRD data can be obtained by direct transmission through the silver sheath.

Inclined Substrate Deposition of MgO

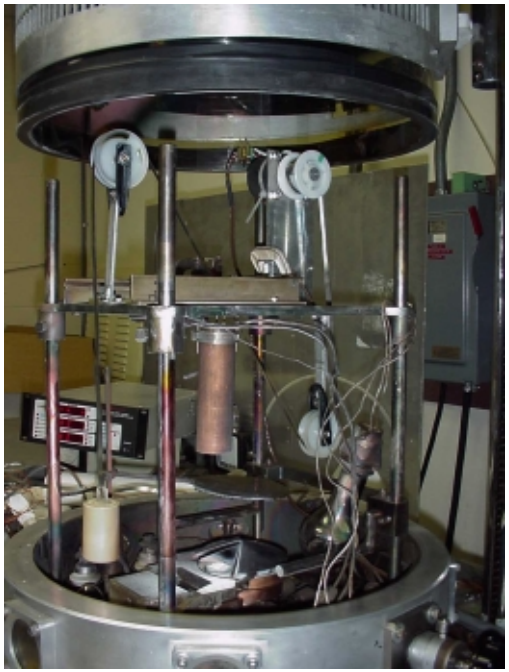


α: inclination angle
β: tilt angle

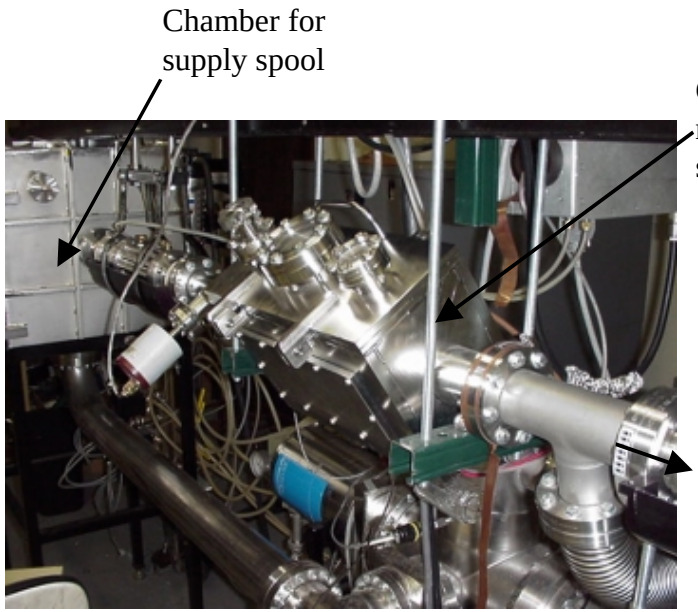
- Simple and fast
- Room temperature process
- Independent of substrate
- Amenable to scale-up
- Produces highly textured MgO films

Scale-up of ISD-MgO ANL-UES Collaboration

Collaboration under AFOSR STTR Program on "Coated High-T_c for Power Systems."



ISD-reel-to-reel setup

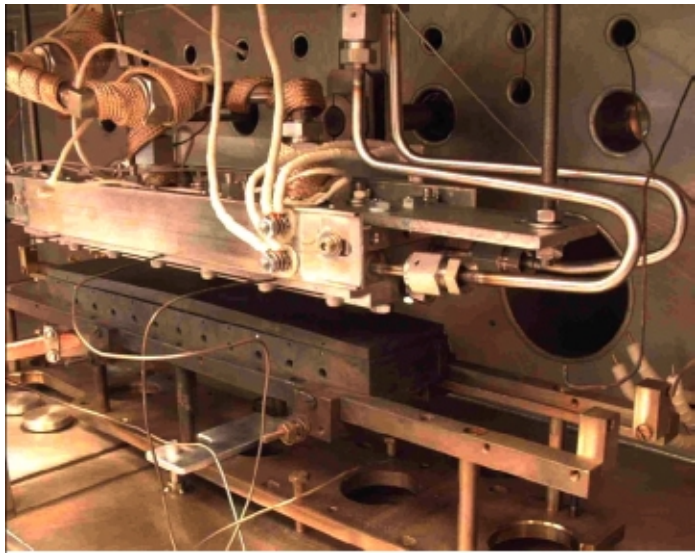


Planar sputtering chamber in the reel-to-reel system

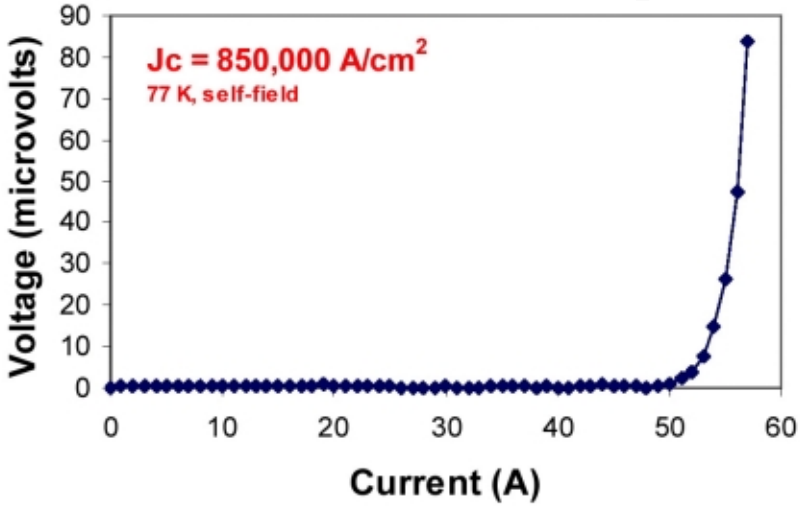
- ≈35-cm-long Hastelloy C tape coated with ISD-MgO
- ϕ-scan FWHM = 12-18°

ANL-IGC Development of MOCVD Process

IGC has begun scaling up MOCVD to long-length tapes.



I_c of 50 A measured over 10 cm of MOCVD tape



MOCVD

- High throughput
- Low capital cost
- Low precursor cost on bulk quantities
- Long uninterrupted deposition runs
- Unlimited deposition zone length

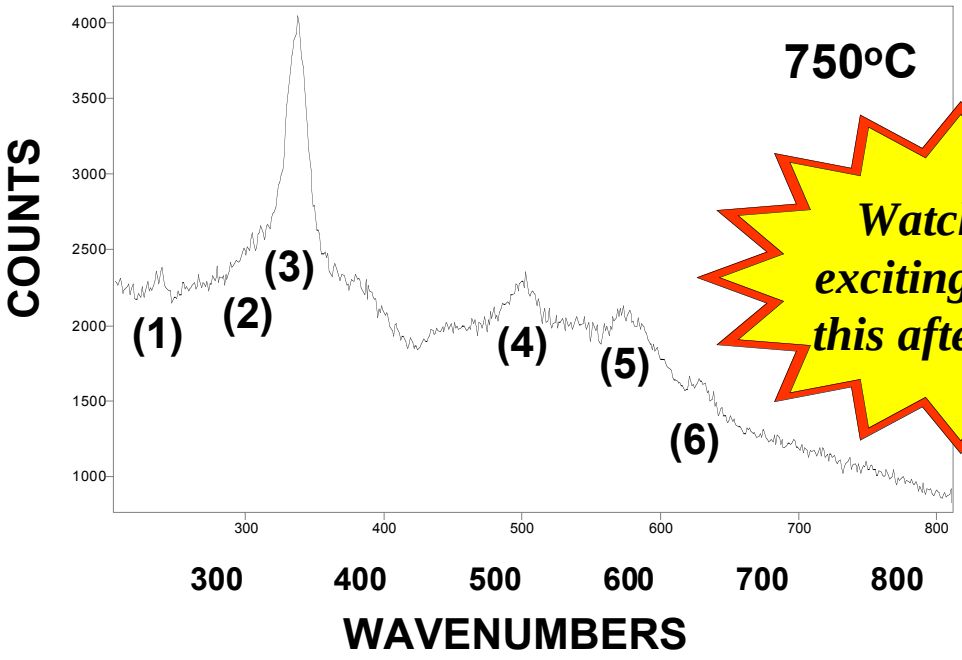
Significant improvement to be disclosed this afternoon!

American Superconductor

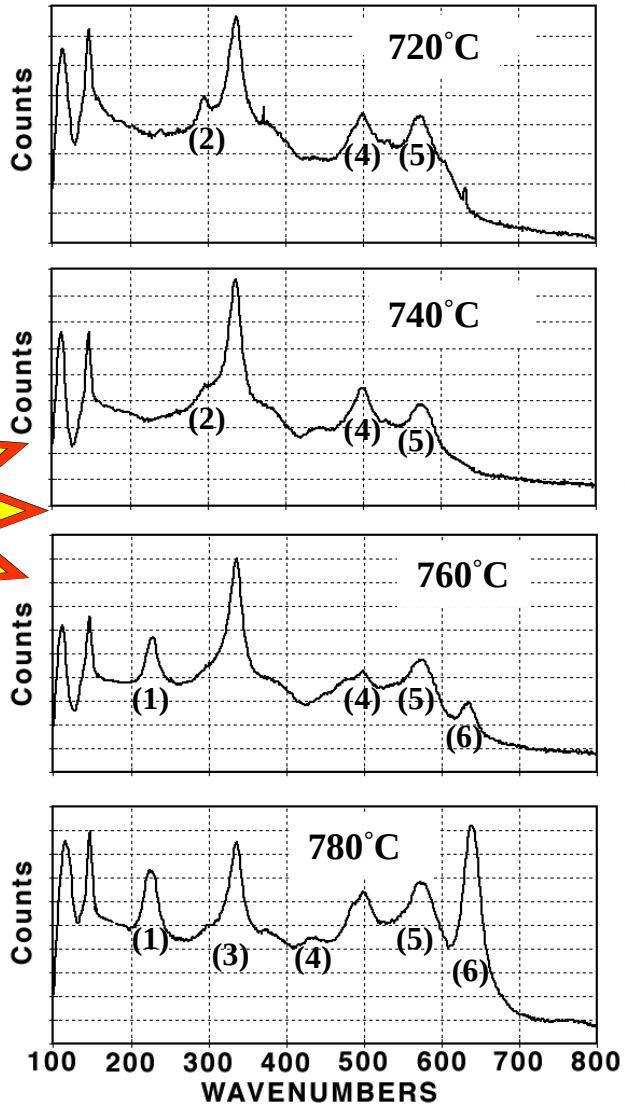
AMSC-ANL Collaboration

Raman Spectra of YBCO Films Prepared Using a Trifluoroacetate (TFA) Precursor

300-nm-thick YBCO films on $LaAlO_3$ (sc)



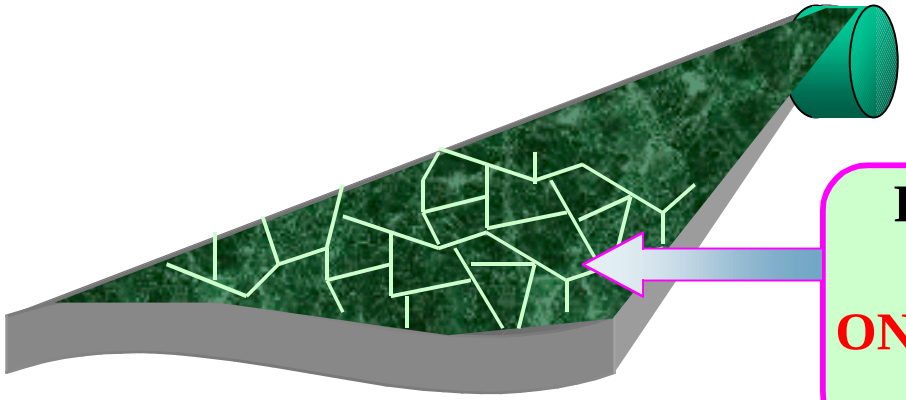
Watch for exciting result this afternoon!



(1) "O" defect
(2) CuO
(3) vs. (4): c-axis verticality
(3) vs. (5): cation disorder
(4) oxygen stoichiometry
(6) $BaCuO_2$

Fundamental Understanding of Underpinning Issues
Collaborative Study with Universities and Other Labs.

COATED CONDUCTORS are envisioned to efficiently transmit electrical power to cities. . .



For most coated conductors, currents will cross ONE MILLION grain boundaries for each meter of length

- Grain boundary doping to enhance critical currents.
- Alteration of atomic arrangement at grain boundaries by low-energy proton irradiation.

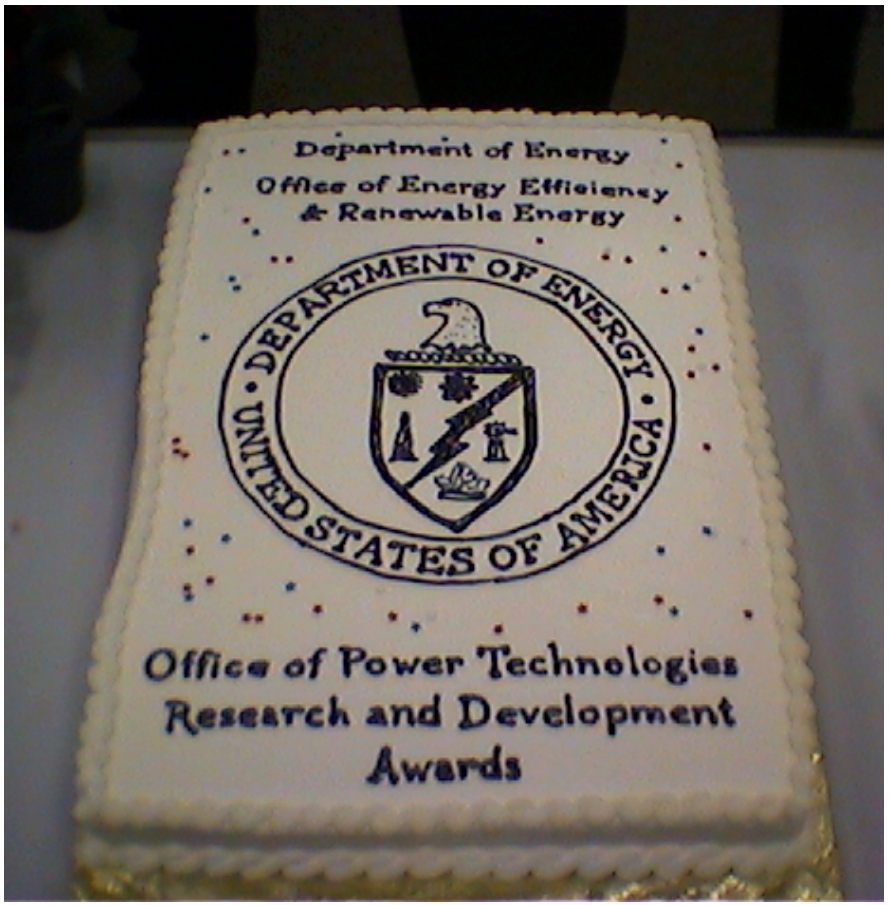
SPI-Flywheel Storage System

BOEING

PHANTOM WORKS

- 10-kWh System (3 kW; 100 kW)
- Accelerated 100-lb. rotor on HTS bearing

R&D – Young Investigator Award
DOE-EERE – Office of Power Technology, Dec. 13, 2001



Student Researchers at ANL